

DOE/EA-xxxx

Draft
ENVIRONMENTAL ASSESSMENT

**Drum Storage Facility for
Interim Storage of Materials Generated by
Environmental Restoration Operations**

U.S. Department of Energy
Rocky Flats Plant
Golden, Colorado



June 1994

SW-A-003674

1/44

[Handwritten signature]

TABLE OF CONTENTS

1.0 SUMMARY	1
2.0 PURPOSE AND NEED FOR THE ACTION	3
3.0 DESCRIPTION OF ALTERNATIVES INCLUDING THE PROPOSED ACTION ...	10
3.1 PROPOSED ACTION	10
3.1.1 CONSTRUCTION	10
3.1.2 OPERATION	13
3.2 NO ACTION	14
3.3 CONCRETE PAD	15
3.4 ADDITIONAL CARGO CONTAINERS	16
3.5 ALTERNATIVES NOT ANALYZED IN DETAIL	17
3.5.1 EXISTING STORAGE FACILITIES	17
3.5.2 PLANNED CENTRALIZED WASTE STORAGE FACILITY	18
3.5.3 NEW STORAGE FACILITY IN ANOTHER LOCATION	20
3.5.4 OFFSITE DRUM STORAGE	20
4.0 AFFECTED ENVIRONMENT	21
4.1 NATURAL ENVIRONMENT	21
4.2 BUILT ENVIRONMENT	23
5.0 ENVIRONMENTAL CONSEQUENCES	24
5.1 PROPOSED ACTION	24
5.1.1 CONSTRUCTION	24
5.1.2 OPERATION	24
5.2 NO ACTION	28
5.3 CONCRETE PAD	28
5.4 ADDITIONAL CARGO CONTAINERS	29
5.5 SUMMARY OF IMPACTS	30
6.0 AGENCIES AND PERSONS CONSULTED	31
7.0 REFERENCES	32

APPENDIX

Safety Analysis: Drill Cuttings Drum Storage Facility

List of Figures

Figure 1 - Rocky Flats Plant Location Map	4
Figure 2 - Location Map for Drill Cuttings Drum Storage Facility and Related Buildings . . .	5
Figure 3 - Site of Proposed Facility in the Field Operations Yard	11

1.0 SUMMARY

This document assesses the environmental effects of alternative means of providing additional storage capacity for drums of material generated by environmental restoration operations at the Department of Energy's (DOE) Rocky Flats Plant (RFP) north of Golden, Colorado. This environmental assessment has been prepared in accordance with the requirements of the National Environmental Policy Act.

A facility is needed to provide additional storage space for drums of material (chiefly soil) generated by environmental restoration operations at RFP that contain, or may contain, hazardous constituents, radioactive constituents, or both.

The Colorado Department of Health (CDH) has issued guidance to DOE stating that drums generated by environmental restoration activities and suspected of containing hazardous constituents must be managed as a hazardous waste from the moment of generation. In accordance with the CDH guidance, such drums are to be taken from their point of generation to one of two approved Resource Conservation and Recovery Act (RCRA) storage units and stored there until their contents are remediated. The storage period could be up to several years.

In response to this guidance, and "best management practices" which require protecting the drums from the harmful effects of weather, DOE proposes to construct and operate a metal building on a concrete pad in RCRA Unit 18.04 in the Field Operations Yard at RFP. The building is proposed to ultimately contain 14,400 square feet, but would initially contain 7,200 square feet.

Alternatives to the proposed action that were considered are:

No Action: The No Action alternative would continue the current practice of placing the drums in RCRA Units 18.03 or 18.04, or, after June 1, 1994, in a 90-day Accumulation Area that is to be designated in the Field Operations Yard, pending return of analytical results of the drum contents. Drums determined to contain uncontaminated material would be disposed of in the RFP landfill or used as clean fill. All other drums would be stored until the site from which they came was remediated, at which time the drum contents would also be remediated, or until some other disposal method was identified and implemented.

Concrete Pad. This alternative would construct a concrete pad but not a building. An uncovered pad would have to be twice as large as the pad with the building to achieve the same capacity since RFP practice permits outdoor stacking of drums only two high because of concerns about winds toppling them, injuring workers or causing drum contents to spill.

Additional Cargo Containers: Placing 57 cargo containers (in addition to the 17 already in use) in Unit 18.04 would provide the same capacity as the 7,200-square-foot building and would occupy over 27,000 square feet. A total of 131 cargo containers would be required to provide the same capacity as the 14,400 square-foot building and would occupy over 50,000 square feet, depending on their configuration.

Existing Storage Facilities: Some existing RFP buildings may become available and may have the potential to act as drum storage facilities. Buildings 223, 440, 553, 788, and 980 are considered and evaluated. This alternative is not analyzed further because there is insufficient space in potentially-available buildings to meet drum storage requirements.

Planned Centralized Waste Storage Facility: Construction of another drum storage facility, referred to as the Centralized Waste Storage Facility (CWSF), started on June 1, 1994 on a site immediately north of the Field Operations Yard. It is possible to stop this project and enlarge the plans for this facility to accommodate 7,200 square feet of additional space for environmental restoration drums, but the site is not large enough for an additional 14,400 square feet of building space. Enlarging the CWSF would delay completion of the CWSF by an estimated 14 months, leading to cessation of all operations at RFP that generate mixed waste for approximately nine months. This is considered an unacceptable consequence and this alternative is not analyzed further.

Storage Facility at Another RFP Location: Because no suitable alternative locations for the proposed facility were identified by a survey of the plantsite, this alternative is not analyzed further.

Store Drums Offsite: An evaluation of offsite storage facilities did not identify any facilities accepting the necessary range of wastes and having DOE approval. Consequently, this alternative was not analyzed further.

The principal environmental issues stemming from the proposed action are health risks to workers in the facility and to the public from operational accidents. There are only negligible impacts to the natural environment, or to workers or the public from exposure to hazardous or radiological contaminants from routine operations. A Safety Analysis considered possible accidents. Based on the highest concentrations of radionuclides and the most toxic chemicals found to date in the drums, the Analysis showed that spillage of drum contents and subsequent inhalation of the resulting dust would result in worker and public exposures that are well within all relevant standards.

2.0 PURPOSE AND NEED

The Department of Energy's (DOE) Rocky Flats Plant (RFP) is located north of Golden, Colorado (Figure 1). RFP's current mission is to remediate the effects of past manufacturing activities by cleaning up sites, both inside and outside buildings, where hazardous and/or radioactive materials have been released. These activities generate waste that may be classified as hazardous, radioactive or mixed (both hazardous and radioactive). The cleanup of outdoor sites generally falls under the purview of various environmental restoration programs. Wastes generated by environmental restoration activities are typically placed in 30- or 55-gallon metal drums pending remediation or disposal. Additional space is needed to provide adequate storage for these drums, referred to as environmental drums. The wastes consist primarily of soil, rocks, sediment and other geologic material. DOE has prepared this Environmental Assessment pursuant to the requirements of the National Environmental Policy Act to consider the environmental effects of alternative means of providing the needed drum storage capacity.

Many of the environmental drums contain constituents regulated by the Resource Conservation and Recovery Act (RCRA), which is administered at RFP by the Colorado Department of Health (CDH). CDH has offered guidance that environmental drums should be brought from their point of generation to one of two locations for storage. One of these locations, RCRA Unit 18.03, known as Tent 1, (Figure 2) is being utilized. The second, RCRA Unit 18.04, is also being used and is an area of the Field Operations Yard in the southeast corner of the industrial area of RFP.

In response to the need for additional storage space, CDH guidance, and best management practices, DOE proposes to construct and operate a building in RCRA Unit 18.04 to store the

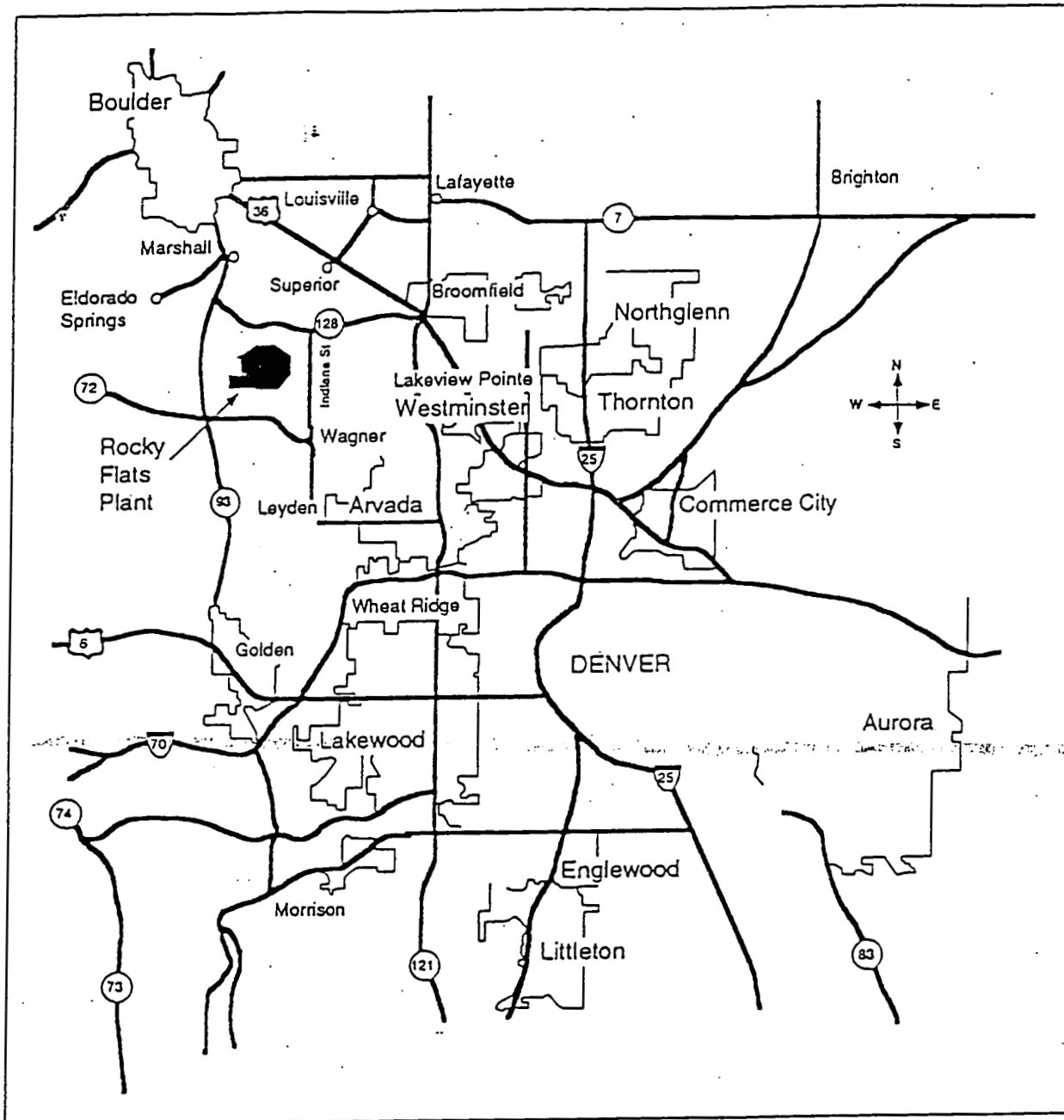


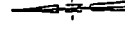
Figure 1 Rocky Flats Plant: Location Map

Best Available Copy

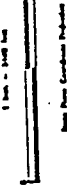
U.S. Department of Energy
Rocky Flats Plant

Figure 2

Location Map for
IDM Drum Storage
Facility and
Related Buildings

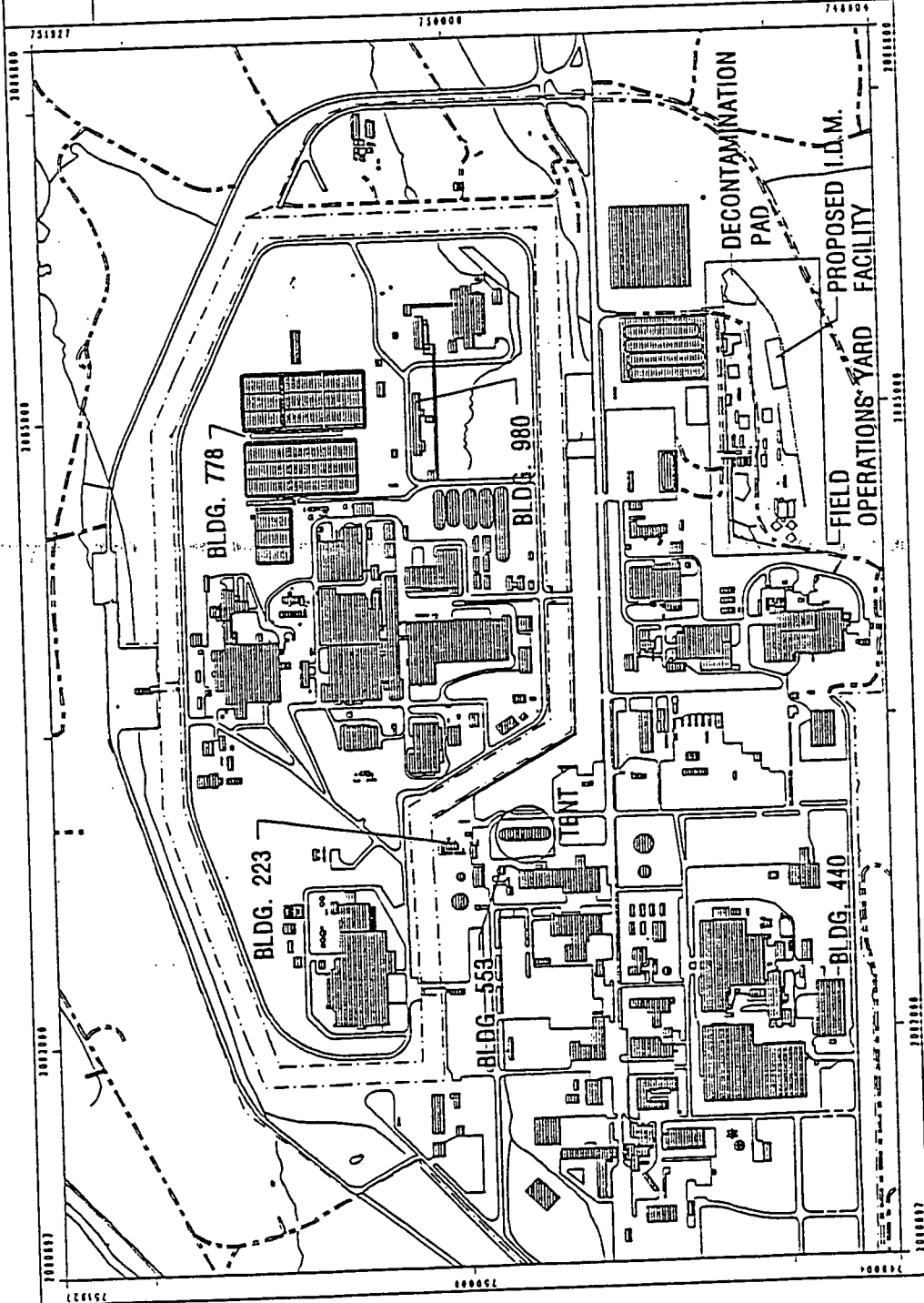


Scale: 1 inch = 1 mile



Prepared by
EG&G ROCKY FLATS

Rocky Flats Plant
P.O. Box 164
Golden, Colorado 80402-0164



Best Available Copy

environmental drums. The building, not specifically required by written guidance, would adhere to best management practices for drum storage that is protected from the weather.

Environmental restoration programs are undertaken pursuant to provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), RCRA, and the Inter-Agency Agreement between CDH, the Environmental Protection Agency (EPA), and DOE. The programs include site characterization and remedial activities, both of which generate materials that may be classified as clean or as hazardous, low-level radioactive, or low-level mixed waste. The materials are placed in metal drums as they are generated.

Site characterization programs include drilling wells and boreholes. This drilling produces cores (cylindrical pieces of material from the hole analyzed to determine subsurface conditions) and drill cuttings (unused material produced by the drill in the course of drilling the hole and producing the core). Using standard operating procedures, the drill cuttings are placed in 30- or 55-gallon drums for storage pending characterization to determine if they contain any hazardous or radioactive contaminants.

Material requiring storage is also generated by remedial activities. Filtercake from the Operable Unit (OU) 2 surface water treatment system is dewatered and placed in drums. The OU 2 treatment process uses granulated activated carbon which, when spent (and therefore contaminated), is stored in various types of approved containers pending decisions on recycling or treatment. Plastic well casings that have deteriorated to the point that they no longer hold their form, or that are in wells that have been abandoned, are removed and sampled for contamination. If contaminated, they are placed in drums for storage. In addition, material classified as "soil/sediment" (such as from cleaning trucks and equipment used in field work or remedial activities) is collected during cleaning and decontamination procedures conducted at the decontamination pad in the Field Operations Yard. This soil/sediment is collected at the pad and placed in drums. Remedial activities at OUs which generate soil that may be contaminated are an additional source of material requiring storage.

In addition, a requested modification to the RCRA permit for Unit 18.04 states that the unit may store "containers with investigatively-derived material from Environmental Restoration activities." Investigatively-derived material (or waste), as defined by the EPA, includes soil cuttings, drilling mud, disposable sampling equipment, disposable personal protective

equipment, and liquids such as groundwater from drilling or sampling and decontamination fluids. Present plans call for geologic materials to be the predominant media stored in the proposed facility, with small quantities of retired well casings, filtercake and granular activated carbon. It is not planned at this time to store other waste media, including liquids and disposable personal protective equipment, in the facility.

In the past, the drums were left in the field at the point of generation pending analytical results of their contents, a process which took more than a year in some cases. In February 1992, CDH offered guidance (CDH, 1992a) that this practice should be replaced by using "process knowledge" (*i.e.*, historic knowledge) to initially identify drums likely to contain hazardous constituents. CDH advised that drums generated at a site where there is reason to believe that hazardous or radioactive materials may be present should be moved within 90 days of generation to RCRA storage Units 18.03, Tent 1 and adjacent cargo containers at Sage Avenue and Seventh Street (Figure 2), or 18.04 in the Field Operations Yard and managed as hazardous waste until the results of analyses of their contents indicates otherwise.

In an initial response to the CDH guidance, DOE initiated a new process for handling the drums which is currently being followed using standard operating procedure FO-23 ("Management of Soil and Sediment Investigation-Derived Material"). Samples are taken of drum contents as the material is generated. Drums from sites where historic knowledge gives no indication that contaminants exist may be left in the field at the point of generation or disposed of at the RFP landfill. Drums filled prior to the implementation of this new process were moved from their point of generation to a non-RCRA location in the Field Operations Yard pending characterization. CDH has ordered that all such drums be moved to Units 18.03 or 18.04 by June 1, 1994 and this order has been implemented. Drums filled since the process was implemented are taken directly to Units 18.03 or 18.04. After June 1, newly-filled drums may also be taken to a new 90-day Accumulation Area that will exist in the Field Operations Yard, depending on their contents and operational considerations. When results of sample analyses are returned on drums in the 90-day Accumulation Area or the non-RCRA area, those drums are relocated to Units 18.03 or 18.04 if necessary. If sample results show that the drum contents include both hazardous and radioactive constituents (*i.e.*, are mixed waste) or contain only hazardous constituents (*i.e.*, are hazardous waste), the drums remain in Unit 18.04. If the contents include neither radioactive nor hazardous constituents, it is expected that they will be taken to the RFP landfill for disposal or used as clean fill. If only radioactive

constituents are found in the drum contents, the drums will be stored at RFP in a facility approved for storage of low-level waste pending disposal.

CDH guidance requires that drums with contaminated contents originating at an OU be managed as part of that OU with regard to final disposition; that is, whatever remedy is deemed necessary for the OU is to be applied to the drummed material from that OU. Until the remedy is identified and implemented, the drums must be stored. CDH also stipulates that these drums cannot be returned to the OU prior to remediation as it could exacerbate cleanup efforts (CDH, 1992b). The proposed drum storage facility would address this need for appropriate space in which to store these drums in a manner consistent with best management practices.

The following table shows the number of environmental drums that is expected to exist at the end of each year through 1997. The table shows that storage space will be required for approximately 2000 drums of waste material generated by environmental operations at least through 1997:

	1993	1994	1995	1996	1997
Number of Drums Generated During the Year	2751	1315	1065	695	655
Number of Drums Released to RFP Landfill During the Year (20% of Total from Prior Year)	174	689	814	854	831
Number of Drums at End of Year	3445	4071	4322	4153	3977
Number of Drums Requiring Storage (50% of Total Drums)		2035	2161	2076	1988

Though the rules for determining which drums must be stored change from time to time, it is estimated that 50% or approximately 2000 drums would require storage (Wisehart 1994). This does not include the approximately 8% of drums that contain free liquids and which are therefore not planned for storage in the proposed facility. The 2000 drums must be stored in RCRA Units 18.03 (Tent 1) or 18.04 according to CDH guidance. Tent 1 has an authorized capacity of 2,640 drums but also contains approximately 8 large containers of spent granular

activated carbon from the OU 2 surface water remedial action, leaving room for only 2,041 environmental drums. However, the floor of Tent 1 has developed cracks. A cracked floor violates the RCRA permit for storage of hazardous wastes. The cracks have been repaired on a regular basis, but new cracks have continued to develop. It is expected that Tent 1 will be closed to continued hazardous waste storage at some point in the future, though it is not known when. Consequently, Tent 1, though used for drum storage at this writing, is not considered to be available for future use.

RCRA Unit 18.04 currently has an authorized capacity of 2,000 drums, but the 17 cargo containers in Unit 18.04, at 38 drums per container, can hold only 646 drums. It is planned that the existing cargo containers would be reserved for existing and future drums containing free liquids, since such drums are not planned for storage in the proposed facility. Any excess cargo containers would be removed. Consequently, the cargo containers in RCRA Unit 18.04 would not be available for the approximately 2000 drums without free liquids requiring storage.

Short-term storage capacity is also required for a variable but relatively small number of drums awaiting return of analytical results of their contents. In addition to these predicted needs, recent experience has shown that unanticipated situations arise which generate potentially-contaminated soil requiring storage.

Best management practices dictate that drums of contaminated material be stored in a centralized location and protected from adverse conditions. A centralized location enhances management of the drums by eliminating the past need to travel throughout RFP's 6,550 acres to scores of sites to conduct the required weekly inspections and, in addition, makes feasible protection of the drums from adverse conditions by consolidating the drums in an area where a shelter can be constructed. Construction of a building would protect drums from precipitation which could hasten their deterioration and from winds which could topple them, endangering workers and causing drum contents to be released to the environment.

In summary, the drum storage facility is proposed to address the need, identified by CDH and best management practices, for a facility in which to store and manage the drums.

3.0 DESCRIPTION OF ALTERNATIVES INCLUDING THE PROPOSED ACTION

3.1 Proposed Action

The proposed action is construction and operation of a 14,400 square foot facility consisting of a prefabricated steel building on a concrete pad in the Field Operations Yard to store drums of soil and other material generated by site characterization and environmental restoration activities being conducted at RFP as described in Section 1. Only phase 1, a 7,200 square foot structure, would be constructed initially. RCRA Unit 18.04, site of the proposed facility in the southeast portion of the Field Operations Yard, is authorized for storage of up to 110,000 gallons (the equivalent of 2,000 55-gallon drums) or 500 cubic yards of characterized hazardous and low-level mixed waste. References to authorized capacities and storage plans are stated in gallons even though liquids are not planned to be stored in the facility because the RCRA permit for Unit 18.04 is stated in gallons and because materials are typically stored in drums whose sizes are stated in gallons. Drums would be subject to real-time radiography or other methods to ensure that free liquids are not present prior to being placed in the proposed facility.

3.1.1 Construction

The proposed site of the facility, RCRA Unit 18.04, is in the southeast portion of the Field Operations Yard located southwest of the 903 Pad (Figure 3). Unit 18.04 currently holds 17 8-foot-by-40-foot cargo containers, each used for storage of up to 38 environmental drums. The proposed building would be constructed on a concrete slab-on-grade. Excavation for concrete footings, grading, and soil compaction would be required. The excavation would produce soils which would be distributed at the building site. Because this portion of the Field Operations Yard is built on imported fill and the excavations would be only in the fill, no contamination is anticipated. The proposed action is construction of a 14,400 square foot building that may be 60-feet by 240-feet or 120-feet by 120-feet. Only half the building, 60-feet by 120-feet or 7,200 square feet, is planned for construction initially. This first phase would have a physical capacity of 2,160 drums stacked four-high. A 6-inch concrete berm would be constructed around the perimeter of the inside of the building to provide secondary containment. The slab would be sloped so that drainage would flow into one or more sumps. Contents of the sumps would be pumped into a tanker truck as needed and taken to one of RFP's water treatment facilities for treatment and subsequent evaporation or discharge. The

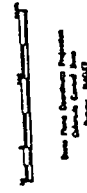
U.S. Department of Energy
Rocky Flats Plant

Figure 3
FIELD OPERATIONS
YARD

== Paved roads
--- Dirt roads
- - - Fence & Boundaries

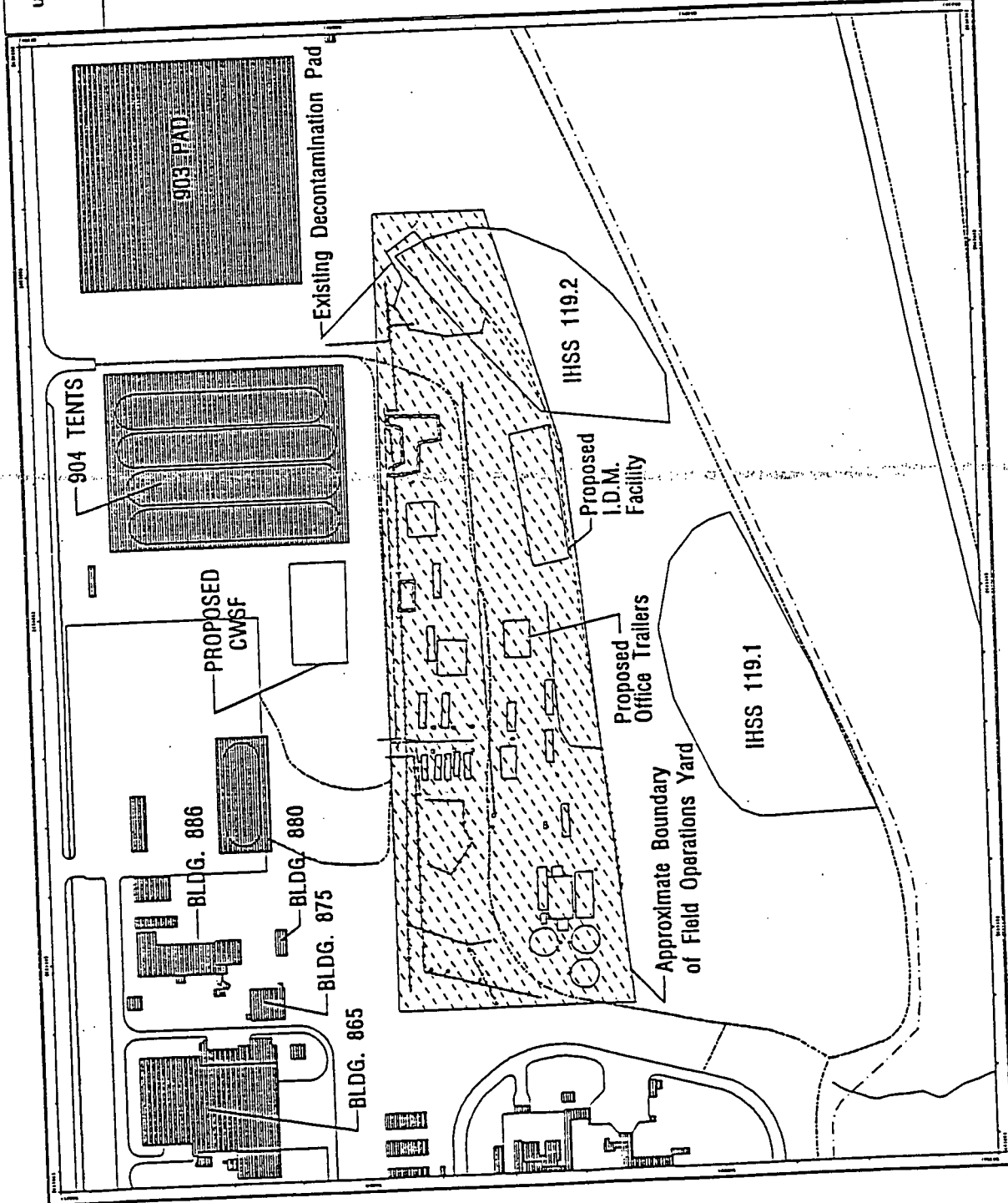


Scale: 1" = 100 feet
1 inch = 100 feet



Prepared by:
EG&B ROCKY FLATS

Rocky Flats Plant
P.O. Box 444
Golden, Colorado 80403-0444



front and back of the building are planned to have roll-up vehicle doors for truck access. These doors would accommodate vehicles as large as a semitrailer truck. Concrete aprons would be installed at both vehicle doors (EG&G, 1993b; EG&G, 1993c). Total cost of the proposed facility is estimated at \$1.18 million, with actual site work and construction costs being approximately \$500,000 (McKeown, 1994, Wisehart, 1994).

The facility would be served with electricity for lighting, convenience outlets, and the roll-up doors. Connection to existing RFP electrical distribution lines would be from a transformer approximately 260 feet northwest of the facility, requiring the placement of two power poles. One pole would be near the building while the other would be approximately midway between the transformer and the building. Convenience outlets would be provided around the building's interior perimeter. The building would not be equipped with a mechanical heating/ventilation/air conditioning system. Ventilation requirements would be addressed by installing turbine ventilators on the roof ridge line. The building contents would not warrant radiological or other safety systems (EG&G, 1993b; EG&G, 1993c), though a fire suppression system may be required. Water for the fire suppression would be supplied by a buried water line. The water line would extend to the building from a previously-planned line that will terminate approximately 280 feet west-northwest of the proposed building. Sewer service would not be provided, nor would there be any office space. Occupational health and safety accessories, such as portable eye wash stations and fire extinguishers, are planned for the facility (EG&G, 1993d). The eyewash stations would be self-contained and not require a water supply.

It is estimated that the facility would be built and operational within a year of approval to begin construction and be in service for the duration of restoration activities at RFP.

Use of the proposed facility as planned is dependent on approval of a requested modification to RFP's RCRA Part B permit submitted to CDH in November 1992 but not yet acted on. Unit 18.04 is currently authorized to store no more than 2,000 fifty-five gallon drums stacked no more than three high in the unit which has no specified physical dimensions. The requested modification would change that to the equivalent of 2,533 fifty-five gallon drums in cargo containers or stacked three-high in a building measuring 60 feet by 120 feet. A further modification request would be required to allow the stacking of drums four-high in a building. These requested changes, if approved, would be sufficient for the initial 7,200 square foot

building but would have to be further modified to accommodate the 14,400 square foot structure.

3.1.2 Operation

The facility is planned to store only waste generated by environmental restoration operations. Operation of the drum storage facility would include, in addition to storage itself, unloading drums, stacking drums, inspecting drums on a weekly basis, and shipping drums from the facility. Shipping is expected to occur when the OU from which the drum contents came is being remediated, at which time the drum contents would be returned to the OU to be remediated; or when other arrangements have been made for storage or disposal of the drum contents.

Approximately 8 percent of the drums have detectable free liquids (Keil, 1993). At the present time, it is planned that the facility would store only drums containing no free liquids (EG&G, 1993c), while drums that do contain free liquids would continue to be stored in RCRA Unit 18.03. The proposed modifications to the RCRA permit for Unit 18.04 would allow up to 48,235 gallons of liquids in the unit, including both the cargo containers and the proposed facility. Storage of drums containing free liquids within the proposed building or its possible later expansion is not planned but could occur in the future. If drums containing free liquids were stored in the building, portable secondary containment, in addition to that provided by the berm around the edge of the floor, would be provided and the building would be heated.

Per the permit modification request, drums without free liquids would be stored four drums high in rows, along a 12-foot wide central aisle. The rows would be arranged to allow the required weekly inspections of individual drums. The central aisle would run the length of the building and be wide enough to permit passage of the truck that would bring the drums into the facility from the field or from 90-day accumulation areas (EG&G, 1993b; EG&G, 1993c). The transport truck would be returned to the RFP motor pool, unless logistics required the truck to remain within the storage facility overnight to complete loading/unloading procedures. A propane-powered forklift would be also be dispatched as needed and would not typically be stored in the facility (Wisehart, 1993).

The building would normally be unoccupied by personnel except during movement or inspection of the drums. Personnel involved in constructing and operating the facility would receive

training in, and would adhere to, the safety practices defined by the RFP Health and Safety Practices Manual. A project-specific Health and Safety Plan for operation of the facility would be developed prior to start-up of storage operations.

A safety analysis has been prepared for the proposed facility. The results of the analysis are more fully discussed in Section 4.1.2, and the full text is presented in the Appendix. The safety analysis identified that the proposed facility would be required to be built and operated under the following DOE orders:

- 5480.21, "Unreviewed Safety Questions", which is used to control changes to facility authorization bases. Authorization bases are the conditions under which a DOE facility is authorized to operate.
- 5481.1B, "Safety Analysis and Review System", applies to DOE operations which involve non-routine hazards including radioactive material in quantities less than those of Category 3 in DOE Order 5480.23. This is the primary safety analysis order for the proposed facility.
- DOE Order 6430.1A, "General Design Criteria", implemented through DOE Order 5480.23. These orders specify design criteria to be used for various types of DOE facilities.

The facility would be operated in accordance with numerous other requirements, including the RCRA permit. Another key requirement is that the proposed facility is to be operated as a non-nuclear facility, meaning that the facility cannot contain more than 8.4 grams of plutonium. This requirement would be met by implementing a process, yet to be developed, to identify the plutonium contents of each drum as it enters or leaves the facility, and keeping a running total of the quantity of plutonium in the building.

3.2 No Action

The No Action alternative involves maintaining the current practice of storing the drums. Drums would be moved from their point of generation to a 90-day storage area pending characterization of their contents. After characterization, drums containing RCRA-regulated

constituents would be moved to RCRA Units 18.03 or 18.04. If the authorized capacity of a unit were reached, a request for change under interim status would be submitted to CDH to increase the authorized capacity of the unit(s). Standard RFP and RCRA procedures for drum management currently in place would likely prevent unsafe practices and accidents from occurring even under No Action. Drum inspection would still take place. As is done in some situations now, individual groups of drums could be covered with plastic sheeting to provide some protection from weathering. RFP practice allows outdoor stacking of drums only two-high and only on a paved surface because of the danger from drums being blown over by high winds injuring workers or releasing their contents to the environment. Because the drums could not be stacked in the unpaved Field Operations Yard, at least four times as much space would be required to accommodate the same number of drums under this alternative as in the proposed building.

The No Action Alternative would not implement best management practices related to storage of drums.

3.3 Concrete Pad

This alternative would involve constructing a concrete pad to be used as a storage facility on the same site as the Proposed Action. Concrete apron ramps would be installed at both ends of the pad to provide truck access for unloading and loading. No utilities would be required to operate this facility.

When storing drums outdoors, RFP practice permits stacking of drums only on paved surfaces and not more than two-high. The restriction to paved surfaces is due to the weight of loaded drums and the possibility of their tipping over if the underlying soil becomes soft such as when wet. The height restriction is to protect workers and the environment from the possibility of drums falling as a result of high winds (which can exceed 100 miles-per-hour), either injuring workers or releasing drum contents to the environment. Additional safety precautions include the requirement that drums stacked outdoors must be on metal, rather than wood, pallets and that each group of four drums on a pallet must be banded together. Because of the restriction to stacking two-high, an uncovered pad would have to be at least twice as large as a building where the drums were stacked four-high to store the same number of drums. The larger pad is estimated to cost approximately \$500,000. In addition, storm water on the

uncovered pad collected in sumps would have to be sampled and treated if necessary before being released. Groups of drums could be covered with plastic sheeting to provide some protection from weathering. This alternative would not implement best management practices for storage of drums because of inadequate shelter for the drums.

3.4 Additional Cargo Containers

Cargo containers are presently in use on an interim basis to store drums. As noted previously, RCRA Unit 18.04 is authorized for cargo containers and currently has 17 such containers storing drums. This alternative would provide an additional 57 cargo containers to hold the same number of drums as would the 7,200 square-foot facility, bringing the total number of cargo containers in Unit 18.04 to 74. The 74 cargo containers and necessary access would occupy over 27,000 square feet, depending on the configuration. It would require a total of 131 cargo containers occupying over 50,000 square feet to provide the same capacity as the proposed 14,400 square foot building. Placing even 74 cargo containers in the Yard would take space now used for other purposes for which there is no alternative space because of competing uses. The area at the east end of the Field Operations Yard, east of Unit 18.04, is occasionally vacant but is commonly used to store or park equipment and material used in environmental restoration activities such as tanker trucks, drill rigs, temporary laboratory trailers, other support vehicles and employee cars (Wisehart, 1994). Other space is not available elsewhere in the Field Operations Yard for the equipment and material. In addition, use of cargo containers would require a change to the RCRA permit modification request of November 1992 to increase the dimensions of RCRA Unit 18.04.

Cargo containers can be purchased, at present, for approximately \$4,000 each. Additional costs are required to bring these containers up to specifications that meet RCRA storage facility standards. Cargo containers must be vented and grounded. A stainless steel pan must be made for each container to provide secondary containment. Since the containers are not large enough to accommodate a forklift, each container must be fitted with rollers on the container floor to allow for loading, unloading, and inspection. These modifications - together with transport, placement, and miscellaneous costs - increase the total cost for each cargo container to approximately \$10,000 (Wisehart, 1993). The additional 57 containers are estimated to cost \$570,000. The additional 114 cargo containers (equivalent to the 14,400 square-foot building) are estimated to cost \$1,140,000.

3.5 Alternatives Not Analyzed in Detail

3.5.1 Existing Storage Facilities

Utilizing existing storage facilities would involve storing drums in existing buildings on the plantsite. The facilities would have to meet the criteria of a RCRA storage area for hazardous, low-level, and low-level mixed waste. A preliminary site survey and space allocation study (EG&G, 1992a and EG&G, 1993a) determined that larger quantities of usable storage space are not available on the plantsite. Storage areas are either essentially full, are being prepared for decontamination and decommissioning efforts, or are too small.

EG&G's Environmental Operations Management Division has continued to review potential options, including reuse of one or more of the following buildings: 223, 553, 440, 788 and 980. None of these buildings would adhere to CDH guidance to consolidate storage of the drums in RCRA Units 18.03 and 18.04.

Building 223 is being readied for use as a drum storage area. This building is being refurbished at an estimated cost of \$10,000 to prepare it to store approximately 500 drums. The building ~~will be ready in mid-1994 and will initially store only CERCLA waste.~~ Modification to the Plant's RCRA permit to allow environmental drums (which contain RCRA waste) to be stored there is not expected to be acted on by CDH in the near future, based on current experience (e.g., permit modifications requests submitted in November 1992 still await CDH action).

Building 553 may become available for use as a drum storage facility. This facility is estimated to cost approximately \$12,000 to refurbish and would hold approximately 220 drums. A possible date by which acquisition and refurbishment might be complete has not been estimated, but the same issue about extensive delay in getting the necessary RCRA permit modification that applies to Building 223 would apply to this building.

Building 440 is under consideration by a number of waste generators at RFP for as possible storage space for waste and is expected to become available for alternative uses in October 1994. With numerous users competing for waste storage space at RFP, Environmental Operations Management has been informed that they are unlikely to be able to use Building 440 due to higher priority waste storage needs.

Building 788 currently sits between two Solar Evaporation Ponds where it was used in conjunction with pondcrete operations. The building no longer has a use and is slated for removal. It may be possible to relocate the building, after it has been decontaminated if necessary, to the Field Operations Yard and use it to store drums. The building is 20 to 30 feet wide and 245 feet long. An analysis (Demass, 1993) of the building concluded that the dimensions of the structure made it impractical to use as a drum storage facility because of the high percentage of the building that would have to be used as aisle space. In addition, it appears at this time that work on making Building 788 available could not begin until the first quarter of calendar year 1995 due to issues surrounding the remedial action at Operable Unit 4 where Building 788 is located. That late start date, combined with the time required to remove, relocate, and reconstruct the building, would result in substantial delay in the availability of the building. In addition, it has not yet been determined if the building can be decontaminated to permit its removal to the Field Operations Yard.

Building 980 is also expected to become available for alternative uses in the future. However, this building is located inside the Plant's Security Controlled Area within the innermost security fence. It is considered impractical to move waste into this area.

In summary of this alternative, only two buildings, Buildings 223 and 553, have been identified as potentially becoming available to provide additional drum storage space. These two buildings together will be able to hold only 720 drums, less than one-third of the required storage capacity. Though acquisition and use of these buildings is being pursued, they will only partially address the need for additional drum storage capacity. Because this alternative cannot meet the expected demand for drum storage space, it is considered unreasonable and not analyzed further.

3.5.2 Planned Centralized Waste Storage Facility

Construction of a metal building known as the Centralized Waste Storage Facility (CWSF) began on June 1, 1994. This facility is planned chiefly to store drums of waste and is located immediately west of the tents on the 904 Pad (Figure 3). There is space on the site of the CWSF to accommodate a larger structure if the orientation of the structure were turned 90 degrees so that its axis was in a north/south direction instead the planned east/west direction. The site is large enough for a CWSF that would accommodate an additional 7,200 square feet of storage

space planned for the initial phase of the proposed action but could not accommodate the additional building length needed for the ultimate 14,400 square feet of storage space that would be provided by the later phase of the proposed action. The CWSF is scheduled to open in November 1994. Construction of the building would have to be stopped, and the contractor demobilized while the building and the heating, ventilation, electrical and other systems that are planned to serve it were re-engineered. In addition, construction of a larger structure would require additional time. There are no incompatibilities between wastes planned for the CWSF and those planned for the proposed facility.

Because construction of the CWSF has already begun, there would be significant, but unknown, costs associated with stopping the project, including payments to the contractor for termination of the contract and demobilization, as well as payment for any work done and the need to redo that work later since the enlarged CWSF would be on a different site. Such costs may be expected to approximately offset any construction cost savings that could result from combining the two buildings.

In addition, it would take approximately 14 months to redesign and re-bid construction of the CWSF (Hummel, 1994a), delaying the opening of that facility to January 1996. It is estimated that in May 1995 RFP will reach a condition called a limiting condition of operations (Hickle, 1994). Limiting condition of operations, in this case, refers to the expectation that RFP would run out of space to store mixed waste, causing all operations generating mixed waste to begin to close down unless or until alternative storage space could be located or a means of disposal implemented. This condition would last nine months, from May 1995 through January 1996. Operations that would be forced to temporarily shut down include the following programs (Hummel, 1994):

- Operations and Maintenance Waste
- Saltcrete
- Solar Pond Remediation Waste
- Transition Waste
 - liquid stabilization
 - thermal stabilization
 - excess chemical disposition
- Environmental Restoration Operable Unit Remediation
- RCRA Unit Closure Activities

Because of the severe effects delaying the CWSF would have on other operations at RFP, and the fact that construction of the CWSF has already begun expanding that facility is considered an unreasonable alternative and is not analyzed further.

3.5.3 New Storage Facility in Another Location

This alternative would involve constructing the proposed storage facility in another location at RFP. A survey of the plantsite for suitable locations identified only the general area of the Facilities Operations Yard as having the necessary flat terrain, accessibility, and large open space (Wisehart, 1993). In addition, implementation of this alternative would not respond to CDH guidance that the drums be moved from the field to RCRA Units 18.03 or 18.04 in the Field Operations Yard. Because of the lack of suitable sites, this alternative is not analyzed further.

3.5.4 Offsite Drum Storage

This alternative would involve transporting the drums to a permitted, DOE-approved storage facility located offsite and storing them there until their contents could be returned to the OU from which they came for treatment or otherwise be properly disposed.

An evaluation of potential offsite storage capability for RFP waste was undertaken by EG&G Radioactive Waste Programs. The conclusion of that evaluation was that "no commercial facilities are currently available for offsite storage of any type of RFP waste for which storage is the key issue" [i.e., low-level mixed or TRU mixed waste] (Hickle, 1994).

In addition, this alternative would require otherwise unnecessary transportation to and from the offsite location of hazardous and/or radioactive wastes, increasing risks to workers and the public. Finally, implementation of this alternative would not adhere to CDH guidance that the drums be moved from the field to RCRA Units 18.03 or 18.04 in the Field Operations Yard.

Because of the lack of offsite facilities and the potential for worker and public exposure to hazardous and radioactive constituents that would result from its implementation, this alternative is not analyzed further.

4.0 AFFECTED ENVIRONMENT

4.1 Natural Environment

RFP is located on 6,550 acres in rural northern Jefferson County, Colorado, 16 miles northwest of downtown Denver as shown in Figure 1. The developed area of the plant occupies approximately 400 acres in the middle of the site. The remaining 6,150 acres is a buffer zone around the active part of RFP. The plant's buffer zone provides a distance of more than one mile between the developed portion of the plant and any public road or private property.

RFP is six miles from the nearest school and 10 miles from the nearest hospital. Approximately 291,000 people live within 10 miles of RFP, over 1,100,000 within 20 miles, while the entire metropolitan Denver area, with a population of over 2.1 million, is within 50 miles of RFP (EG&G, 1992b). Population centers are generally to the east and southeast of the plant.

Land uses adjacent to RFP are agricultural to the west, agricultural with some industrial to the south, agricultural and very low-density residential to the east, and agricultural/open space to the north.

The climate at RFP is characterized by dry, cool winters with some snow cover and warm summers. The average annual precipitation for the area is 15 inches. Winds are predominantly out of the west and northwest. The average wind velocity is 8 to 9 miles per hour. Wind gusts exceeding 60 miles per hour occur frequently throughout the year and gusts exceeding 100 miles per hour occur occasionally. Peak gusts are usually associated with the winter months.

Surface drainage along the Front Range is primarily west to east. RFP drainage flows into three ephemeral streams: Rock Creek, Walnut Creek, and Woman Creek. The proposed site lies within the Woman Creek watershed. Surface runoff from the site flows into the South Interceptor Ditch which empties into Pond C-2. Currently, Pond C-2 water is periodically released downstream.

There are no wetlands on or adjoining the proposed project site (DQE, 1991) and the site is not located within the 100-year floodplain, as classified by the U.S. Army Corps of Engineers (COE, 1992).

The site of the proposed facility in the Field Operations Yard consists of imported fill material, brought in to extend the Field Operations Yard to the south at the same elevation as the rest of the Yard. Underlying native soils are almost entirely Flatirons very cobbly sandy loam with 0-to-3 percent slopes.

As a result of past clearing, grading and gravel placement activities in constructing and operating the Field Operations Yard and through ongoing use of the Yard, there is minimal vegetation and animal life at the proposed storage facility site. The proposed site is located near the fence that separates the industrial area of the plantsite from the buffer zone. The fence effectively excludes most larger mammals from the Field Operations Yard, although deer, raccoons, and coyotes occasionally wander into the developed portion of RFP. Habitat and foodstuffs are scarce within the industrial area; thus, few animals are attracted there.

The RFP buffer zone provides habitat potentially suitable for the Ute Ladies'-Tresses, an orchid listed by the United States Fish and Wildlife Service as "threatened". However, no individuals of the species were found on the plantsite in the first or second of three consecutive annual sitewide surveys (ESCO, 1993). The buffer zone harbors several animal species of State concern, but no animal species currently listed by the United States Fish and Wildlife Service as "threatened" or "endangered".

A small community of a Colorado plant "species of concern", the forktip threeawn, has been identified along the railroad tracks that enter RFP from the west along the west access road. This area is over a mile from the site of the proposed facility.

Habitat suitable for a federal Category 2 plant species (a species whose listing as "threatened" or "endangered" may be appropriate, but for which adequate data are not available), the Colorado Butterfly Weed, exists at RFP, but no individual of the species has been found in recent surveys (ESCO, 1993).

An animal species that is both a Colorado "species of concern" and a federal Category 2 species, the Prebles' jumping mouse, is a resident of many of the riparian areas at RFP, including those along Woman Creek. Woman Creek and the habitat it provides are over 600 feet from the site of the proposed drum storage facility and would not be affected by its construction and operation.

4.2 Built Environment

The built environment surrounding the site of the proposed facility is industrial to the west and north and undeveloped (RFP buffer zone) to the south and east. The Field Operations Yard is approximately 10 acres (Figure 3). Other structures located within the Field Operations Yard are a decontamination pad/vehicle wash rack, a wind gauge, trailers housing field offices, and storage facilities. RCRA Unit 18.04, the proposed site, contains 17 cargo containers. Wood pallets, empty drums, drums of waste, and miscellaneous equipment and supplies are stored at the proposed site. Several cargo containers are located in the northwest portion of the Field Operations Yard and are used for warehousing equipment and supplies. In addition, there is a 90-day accumulation area in the Yard for drums generated by environmental restoration activities.

The 904 Tents are located north of the Field Operations Yard and store hazardous wastes. These tents lie directly east of the 904 Pad (Individual Hazardous Substance Site [IHSS] 213) and directly north of the proposed site. The IHSSs that constitute OU 2 lie east of the Field Operations Yard. According to recent site characterization reporting, OU 2 is contaminated with volatile organic compounds, dissolved metals, and some radionuclides (EG&G, 1992b). The established contaminant plume for this OU flows away from the proposed storage facility site. It is believed that there is no contamination on or under the Field Operations Yard where the facility is to be located.

The 800 buildings and related trailers are due west of the Field Operations Yard. OU 1, which is associated with operations formerly conducted in Building 881, lies southwest of the Field Operations Yard. IHSS 119.2, which is part of OU 1, is located immediately south of the site of the proposed facility between the edge of the Field Operations Yard and the fence between the Security Controlled Area and the Buffer Zone. The proposed facility would be located at least 70 feet west of IHSS 119.2 and construction and operation of the facility would have no effect on the IHSS or possible remedial actions there, based on current knowledge of the extent of that IHSS.

IHSS 119.1, which is also part of OU 1, is located 200 feet southwest of the site of the proposed facility and would be similarly unaffected by it. Site characterization reporting for OU 1 indicates that the potential plume of contaminants does not affect the proposed site (EG&G, 1992b).

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Proposed Action

5.1.1 Construction

Construction of the proposed drum storage facility as well as excavations for related utilities would take place on fill material barren of vegetative cover in the Field Operations Yard and, consequently, would have essentially no impacts to the natural or built environment. There would be minor air emissions (fugitive dust and vehicle exhaust), consumption of construction materials, and minor alterations to, and long-term occupation of, an area. Impacts to the environment from site preparation and the subsequent presence of the pad and building are also expected to be minimal since the site is already level and has previously been substantially altered from its natural state by the addition of fill material and by grading. As a consequence of these earlier activities, there are essentially no flora or fauna at the site to be affected. No impacts would occur to threatened or endangered species or environmentally-sensitive areas because of their distance from the site of the proposed facility.

5.1.2 Operation

Operation of the proposed facility would have essentially no impacts to the natural environment, including threatened or endangered species or environmentally-sensitive areas. Transportation of drums from their present locations to the facility, an operation already going on, would involve small quantities of vehicular traffic on unpaved roads producing exceedingly small quantities of exhaust emissions and dust relative to that produced daily at RFP.

Routine facility operations would be expected to have negligible effects to the natural environment, workers and the public. Accidents could have effects, though negligible, on

individuals both on and off the RFP site. Both have been analyzed in a Preliminary Safety Analysis and are discussed below.

A Safety Analysis of the proposed facility has been prepared by EG&G's Safety Analysis Engineering Division. That analysis is based on the following assumptions which are conditions of operations for the facility:

- the concentrations of hazardous and radioactive contaminants in the drums will not significantly exceed those found to date upon which the Safety Analysis is based.
- drums would be subjected to real-time radiography or other methods to determine if free liquids are present. Only drums determined to contain no free liquids would be stored in the facility.
- the facility would be as described in Section 2.
- the facility would operate under the conditions of the proposed RCRA permit modifications.
- the facility would contain no office space and would typically be unoccupied except when drums are being moved or inspected.
- drums would be unvented.
- the facility would be operated as a non-nuclear facility, *i.e.*, the facility would operate under controls that assure that not more than 8.4 grams of plutonium would be stored in the facility at one time regardless of the size of the facility.
- there would be no opening or repackaging of drums in the facility.
- facility operation would be in accordance with established standard operating procedures and the RFP Health and Safety Manual.

Using these assumptions, the Safety Analysis (see the Appendix for full text) of the proposed drum storage facility identified hazardous components that would be expected to enter the building mixed with the contents of the drums. Based on prior analysis of drum contents, the most toxic contaminants, or those found in highest concentrations, were trichloroethene (17 mg/kg), methylene chloride (9 mg/kg), acetone (39 mg/kg), plutonium (180 pCi/g [pico Curies per gram] alpha activity), beryllium 18.3 (mg/kg) and lead (86.9 mg/kg).

Routine Operations

Using these maximum concentrations as the basis for analysis, the safety analysis reached the following conclusions regarding routine operation of the proposed facility:

Worker and Public Exposure to Chemicals. Because the facility would store materials in drums that are non-vented, virtually no emissions would be expected from routine operations because of the soil matrixing of the contaminants and the basic integrity of the drums. Therefore, carcinogenic and non-carcinogenic human health effects attributable to routine operations are expected to be negligible for both workers and the public.

Worker Exposure to Radiation. Measured contamination levels are extremely low and the contaminants are contained in closed metal containers. Alpha radiation from Pu²³⁹ is the dominant exposure hazard but is shielded by the soil and the walls of the drums. Consequently, worker exposure to radiation from routine operations is expected to be negligible.

Public Exposure to Radiation. Under routine operating conditions, release of radioactive material is not expected to occur due to container integrity. There would be no impacts to public health or safety from routine operations of the proposed facility.

Accidents

In addition to routine operations, the Safety Analysis analyzed potential exposures and risks from postulated accidents.

Worker Exposure to Radiation. The worst-case radiation exposure for a worker was determined by calculating the results of an accident involving the spilling of several drums of soil

contaminated with plutonium at the maximum allowed for low-level waste (100 nCi/g [nano Curies per gram]), the highest degree of radioactivity that would be allowed in the facility), creating a dust cloud which was then inhaled by a worker for one minute. This is a conservative scenario because workers are trained to evacuate an accident site immediately. The calculated exposure to plutonium is 0.69 rem/hr or 0.0115 rem for the one-minute exposure. This exceedingly small exposure is well within not only DOE's limit for annual routine exposure (5.0 rem), but also the RFP limit of 1.0 rem per year for routine exposure.

Worker Exposure to Chemicals. The same accident scenario was used to identify worker exposure to, and risks from, chemicals. The analysis showed that the concentrations of chemical contaminants in the air, to which a worker was conservatively estimated to be exposed for one minute, were less than those allowed by the Occupational Safety and Health Administration (OSHA) for 40 hours' exposure, and therefore are expected to present negligible risks to workers.

Public Exposure to Radiation. The degree of exposure of a member of the public to radiation as the result of an accident was based on an accident scenario involving the crash of an aircraft into the facility releasing all of the 8.4 grams of plutonium that the building would be allowed to contain at any one time. The maximally-exposed individual in such a scenario was calculated to receive a whole-body dose of $1.8\text{E}-2$ (0.018) rem, well below not only the DOE limit of 25 rem per year for exposure by a member of the public from an accident but also the annual limit of 0.5 rem from routine exposures.

Public Exposure to Chemicals. Public exposure to chemicals was calculated on the basis of an accident involving a small plane crashing into the facility, releasing the chemicals at the maximum concentrations recorded to date. The risk to a member of the public of developing cancer from such an event was calculated at $5.0\text{E}-9$ or 5 chances in one billion.

Based on the foregoing, exposure of workers and the public to both hazardous and radioactive contaminants from routine operations of the proposed facility is expected to be negligible because neither hazardous nor radioactive contaminants would escape the drums and even releases as the result of an accident would be expected to be within acceptable limits.

In addition, based on the analysis above and on the operational conditions described in Section 2.1.2, no effects to the natural environment would be expected from operation of the facility because all activities would take place within the building and, under routine operating conditions, there would be no release of contaminated material inside or outside the structure.

5.2 No Action

The No Action alternative consists of continuing with status quo conditions: bringing the drums to the Field Operations Yard for outdoor storage shortly after they are generated. This alternative would result in having the drums in a central location for ease of inspection but would leave the drums exposed to the deleterious effects of weather, counter to best management practices. The possibility of accidental release of drum contents to the environment would be greater than with the proposed facility because of the lack of protection for the drums from weather-caused deterioration and because if drums were to rupture, any hazardous or radiological contaminants spilled would be outdoors and more easily spread. Because drums stored outdoors on unpaved surfaces are not stacked, this alternative would occupy a site approximately four-times as large as the proposed action for comparable storage capacity.

5.3 Concrete Pad

Constructing an uncovered pad would create many of the same short-term impacts from construction activities (e.g., fugitive dust, emissions from construction equipment, and soil disturbance for footers) as would construction of the proposed facility. The pad would allow RFP to meet the terms of CDH guidance by providing a single storage facility for environmental drums in RCRA Unit 18.04, but would not respond to best management practices for protection of the drums from weather.

RFP practice allows drums to be stacked outdoors two-high on a paved surface. Thus, a pad approximately twice as large as that needed for a building would be required to store the same number of drums. Because of the previously-disturbed nature of the Field Operations Yard, construction of a larger pad would not be expected to have any greater environmental impacts than construction of the smaller pad. However, there is insufficient space in the Yard to accommodate the larger pad. Weathering of the drums would be hastened, although they could be covered with tarpaulins or similar covers to retard the effects of weather. Corrosion, spillage,

or leaks could allow potentially-contaminated material to enter the water and air streams, possibly in spite of regular inspections. Although a pad would provide secondary containment for spilled material, such containment would likely be of little effect in the presence of strong winds which could blow spilled material off the pad, disbursing it to surrounding soils and the atmosphere. Once in the environment, depending upon the type of contaminant, the material could adversely affect water and air quality and their associated ecosystems. Because of generally low initial concentrations and subsequent dilution, however, such a situation would be unlikely to have any measurable effect on human or environmental health.

5.4 Additional Cargo Containers

Additional cargo containers would use three-and-one-half-to-four-times as much land area as the equivalent storage capacity in a building due to the inability to stack drums in the cargo containers. As with the larger concrete pad, this would result in severe operational problems in the Yard, substantially reducing space needed for other Yard uses. As indicated in Section 3, there are essentially no flora or fauna in the Yard to be effected by occupation of the larger area. Use of additional cargo containers would have environmental effects similar to the proposed action and construction of only the pad. While no construction materials would be used under this alternative, materials would be consumed in preparing the cargo containers for use. In addition, maintaining access to the cargo containers in the unpaved Field Operations Yard during rain and snow conditions would be expected to present serious difficulties to operations. These factors would each have even greater impact if more than 74 cargo containers were used.

5.5 Summary of Impacts

A summary of the environmental consequences of each alternative is presented below.

<u>Alternative</u>	Impacts From Operations	Impacts From Accidents
Proposed Action	consumption of construction materials; disturbance and long-term occupation of an already-disturbed site	negligible impacts to the natural and built environment; human exposures to hazardous and radiological contaminants well within applicable standards.
No Action	disturbance and long-term occupation of an already disturbed site.	negligible impacts to natural and built environment; potential for release of contaminants not quantified but believed greater than under the proposed action because of lack of protection for drums from weather resulting in slightly greater probability of spillage of drum contents due to weather-related factors (wind, accelerated rusting); any release would be a release to the natural environment rather than to a building and would have a greater chance of reaching a member of the public than under the proposed action, but low concentrations of contaminants pose little threat to the environment or the public; greater difficulty in carrying out required weekly inspections in bad weather than under proposed action.
Concrete Pad	generally the same as for the Proposed Action, though fewer construction materials would be consumed.	same as for the No Action alternative; in addition, it would be necessary to collect and collect treat storm water runoff from the pad.
Additional Cargo Containers	minor disturbance to and long term occupation of an already disturbed area; installation of additional cargo containers would occupy approximately three-and-one-half-times the land area of the equivalent amount of storage space under the Proposed Action	negligible impacts to natural and built environment; greater difficulty in carrying out required weekly inspections in inclement weather than under proposed action due to difficulties in accessing containers in mud or snow conditions; acute operational problems in Field Operations Yard due to large amount of space occupied by cargo containers needed for other purposes for which there is not an alternative location.

6.0 AGENCIES AND PERSONS CONSULTED

None

7.0 REFERENCES

- CDH, 1991. Colorado Department of Health, Hazardous Materials and Waste Management Division. Correspondence from Gary W. Baughman, Unit Leader, to David P. Simonson, U.S. Department of Energy, Rocky Flats Office, dated August 30, 1991.
- CDH, 1992a. Colorado Department of Health, Hazardous Materials and Waste Management Division. Correspondence from Gary W. Baughman, Unit Leader, Hazardous Waste Facilities, to Frazer Lockhart, U.S. Department of Energy, Rocky Flats Office, *Storage and Handling of Hazardous Waste Generated during Corrective Action Activities at the Rocky Flats Plant*, February 10, 1992.
- CDH, 1992b. Colorado Department of Health, Hazardous Materials and Waste Management Division. Correspondence from Gary W. Baughman, Unit Leader, Hazardous Waste Facilities, to Frazer Lockhart, U.S. Department of Energy, Rocky Flats Office, *Storage and Handling of Investigative Derived Waste (IDW) and Hazardous Investigative Derived Waste (HIDW)*, June 12, 1992.
- COE, 1992. U.S. Army Corps of Engineers, Omaha District. *Floodplain Delineation Study: 100-Year Flood Outlines*, for Department of Energy, Rocky Flats Plant, I.A.G. #DE-AI34-90 57446, September, 1992.
- Demass, 1993. Demass, T. E., EG&G, Environmental Restoration Management Division, "Reuse of Building 788 for Investigatively-Derived Material Storage Facility", memorandum dated November 29, 1993.
- DOE, 1991. U. S. Department of Energy, Rocky Flats Office, *Wetlands Assessment, Rocky Flats Plantsite*, Golden, Colorado, April 1, 1991.
- DOE, 1992. U.S. Department of Energy, Rocky Flats Office, *Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at the Rocky Flats Plant, Final Report*, September, 1992.
- EG&G, 1992a. EG&G Rocky Flats, Inc., *Alternative Use Evaluation*, October 1992.
- EG&G, 1992b. EG&G Rocky Flats, Inc. *Rocky Flats Plantsite Environmental Report for 1991*, December, 1992.
- EG&G, 1993a. EG&G Rocky Flats, Inc., *Mission Transition Program Management Plan*, March 11, 1993.
- EG&G, 1993b. EG&G Rocky Flats, Inc. Interoffice Correspondence from R. R. Wisehart, Environmental Restoration/Field Operations Management, to Distribution: *Specifications on Drill Cutting Drum Storage*, August 5, 1993.

- EG&G, 1993c. EG&G Rocky Flats, Inc. Interoffice Correspondence from S. M. Nesta, Ecology and NEPA Division, to D. R. Swanson, Safety Analysis Engineering: *Preparation of Preliminary Hazard Analysis for Proposed Drill Cuttings Drum Storage Facility — SMN-258-93*, August 6, 1993.
- EG&G, 1993d. EG&G Rocky Flats, Inc.. Work Package Number 12968. *Section 4.1: Work Package — FY 94 Scope Summary/Assumptions*, August 1993.
- EG&G, 1993e. EG&G Rocky Flats, Inc., Environmental Management Department. *EMD Operation Procedures, Volume 1 — Field Operations: #FO.8: Handling of Drilling Fluids and Cuttings; #FO.10: Receiving, Labeling, and Handling Environmental Materials Containers; and #FO.23: Management of Soil and Sediment Investigative Derived Materials (IDM)*, Manual No. 5-21000, OPS-FO, revision 52, August 11, 1993.
- ESCO, 1993. ESCO Associates, *Report of Findings: Ute Ladies'-Tresses and Colorado Butterfly Weed Surveys*, 1993.
- Hickle, 1994. Hickle, G. L., EG&G Rocky Flats, Inc., Radioactive Waste Programs, memorandum to Comprehensive Waste Management Plan File dated January 21, 1994.
- Hummel, 1994a. Hummel, Terry, EG&G Radioactive Waste Programs, personal communication, May 27, 1994.
- Hummel, 1994b. Hummel, Terry, EG&G Radioactive Waste Programs, personal communication, February 9, 1994.
- Keil, 1993. Keil, Edward, EG&G Environmental Restoration/Facilities Operations Management, personal interview, August 24, 1993.
- Keil, 1994. Keil, Edward, EG&G Environmental Restoration/Facilities Operations Management, personal communication, February 11, 1994.
- Kinney, 1994. Kinney, Joellen, EG&G Engineering Project Management, personal communication, February 25, 1994.
- McKeown, 1994. McKeown, John, EG&G Environmental Restoration/Facilities Operations Management, personal interview, February 22, 1994.
- Wisehart, 1993. Wisehart, Roger, EG&G Environmental Restoration/Facilities Operations Management, personal interview, August 24, 1993.
- Wisehart, 1994. Wisehart, Roger, EG&G Environmental Restoration/Facilities Operations Management, personal communication, May 23, 1994.

APPENDIX

Safety Analysis: Drill Cuttings Drum Storage Facility

Safety Analysis Engineering Division
Nuclear Safety Engineering Department
EG&G Rocky Flats, Inc.

November 19, 1993

* * * * *

SAFETY ANALYSIS
DRILL CUTTINGS DRUM STORAGE FACILITY

November 19, 1993

Revision 1

Prepared by: Gabriel Reybel 11-19-93

Reviewed by: Paul B. Dandrea 11-19-93

Approved by: Don Swanson 11-19-93

1.0 INTRODUCTION

This analysis was performed to assess the hazards associated with a storage facility for drums containing soil from the investigative drilling operations around the Rocky Flats Site. The material in the drums may or may not be contaminated, and needs to be stored until samples are characterized. Material below background contaminant level will be disposed of in the landfill or returned to the removal site. Analysis of soil samples has identified radioactivity in the pico-curie range, as well as chemical contaminants, which classifies the material as low-level mixed waste. The drums are subject to real-time radiography or other methods to determine if free liquids are present. Only drums determined to contain no free liquids will be stored in the facility.

2.0 FACILITY DESIGN

The storage facility will be enclosed to optimize the use of space by allowing drum stacking. The enclosure will protect the stacked drums from high winds and prevent windblown dispersal of potential contaminated soil. The facility is planned as a metal building on a concrete pad on the southeast side of the Contractor Support yard south of the 904 Pad. The building could be as big as 60 feet by 120 feet and will be able to store up to 2200, 55 gallon drums of drill cuttings and other material produced during site characterization, environmental remediation and similar activities conducted by the Environmental Restoration Management Division. The storage facility will not have a mechanical heating/ventilation/air conditioning system; ventilation will be provided by windows in the building walls and ventilators in the roof. Because of the nature of the materials to be stored in the facility, no fire suppression, radiological or other safety systems are planned. The facility will typically be unoccupied except when drums are being moved or inspected.

Currently only one storage facility is being planned, however a second one may be built in the general vicinity (i.e. within 100 feet of the first facility). It will be identical in design and construction and store similar material. This analysis will be applicable to both facilities.

3.0 SAFETY ANALYSIS REGULATORY REQUIREMENTS

The following are the primary DOE Orders that are applicable to the performance of safety analyses and reviews for the drum storage facility:

- DOE Order 6430.1A, *General Design Criteria*, April 6, 1989
- DOE Order 5481.1B, *Safety Analysis and Review System*, September 23, 1986

DOE Order 6430.1A establishes the design criteria for DOE facilities. Section 0110, "Architectural and Special Design Requirements", Paragraph 0110-5.2, "Safety Analysis", states the following:

"All DOE facilities shall be evaluated for potential risks to the operators, the public, and the environment".

DOE Order 5481.1B applies to "DOE Operations" which involve non-routine hazards, including radioactive material in quantities less than DOE Order 5480.23 Category 3

thresholds. This is the primary safety analysis Order for the Drill Cutting Drum Storage Facility.

As long as the facility contains radioactive material inventories below established thresholds (Reference 7), it is designated as a non-nuclear facility, and the requirements of DOE Order 5481.1B apply. If the radioactive material inventory exceeds established thresholds, then DOE Order 5480.23 applies.

4.0 HAZARDS ANALYSIS

4.1 Hazards Material Inventory

The soils that will be stored in the drum storage facility have been found to contain radionuclides, semi-volatiles, volatiles, and metals (Reference 1). The hazardous material concentrations for the semi-volatiles and volatiles are in the $\mu\text{g/kg-soil}$ range. The radionuclide concentrations are in the pCi/g-soil range and the metals concentration are in the mg/kg-soil range.

The five chemicals in Table 1 were chosen for detailed calculations (Reference 1, Table 2-2) to determine the concentration that a worker or a member of the general public could be exposed to in the event of an accidental release of the material. These five chemicals represent a selection of the worst case chemical hazards in the soils analyzed based on highest concentrations or toxicity. The materials selected were, Trichloroethene (17 mg/kg), Methylene Chloride (9 mg/kg), Acetone (39 mg/kg), Plutonium (180 pCi/g alpha-activity), Beryllium (18.3 mg/Kg) and Lead (86.9 mg/Kg). These concentrations represent the maximum concentrations or toxicity found in the soil samples that have been analyzed.

The highest radioactivity measured was 180 pCi/gram Plutonium. Since Low Level Waste can have a maximum of 100 nCi/gm , a limit of 8.4 grams of Plutonium it assumed for the building. If this limit is exceeded, the facility must comply with DOE Order 5480.23, "Nuclear Safety Analysis Reports".

Table 1 Results From Dense-Cloud Scenario

Material	Calculated Air Concentration (mg/m^3)	TWA (mg/m^3)
Trichloroethene	2.55E-4	2.7E+2
Methylene Chloride	1.35E-4	1.75E+2
Acetone	5.85E-4	2.4E+3
Lead	1.30E-3	5.0E-2
Beryllium	2.75E-4	2.0E-3

4.2 Hazard from Routine Operations

The drill cuttings drum storage facility will store soil from site investigative activities in 55-gal drums that are typically non-vented. Little if any emissions are expected from routine operations in the facility because of the soil matrixing of the contaminants and basic drum integrity. Therefore, carcinogenic and non-carcinogenic human health effects attributable to routine operations is expected to be negligible both for the worker and public.

4.2.1 Worker Exposures to Radiation

Worker radiation exposures are expected to be minimal. The measured contamination levels are extremely low and the contaminants are contained within closed metal containers. Alpha (α) radiation from Pu-239 is the dominant exposure hazard and is shielded by the soil and the walls of the container.

Worker exposures to radiation under normal operations would be controlled under established procedures that require doses to be kept as low as reasonably achievable and that limits any individual's dose to less than 5 rem per year. Administrative Dose Guidelines established for Rocky Flats workers limits the occupational radiation doses to less than 1.0 rem per year.

4.2.2 Worker Exposures to Chemicals

Facility operations are limited to the storage, handling, and inspection of the drums. Since the drill cuttings are inside closed containers, worker exposures to hazardous chemicals, during routine operations are expected to remain well below the OSHA recommended levels.

4.2.3 Radiological Exposure to Public

Under routine operating conditions, the release of radioactive material is not postulated, due to container integrity. There are no impacts to the health and safety of the public from any external radiation.

4.2.4 Hazardous Chemical Exposure to Public

Under routine operating conditions, the release of airborne particulates is not postulated, due to container integrity. There would be no offsite hazardous chemical impacts to the public from the materials contained in the drill cutting drums. Public exposures and associated health effects would occur due to transportation vehicle emissions. These impacts would be very small.

4.3 Accident Analysis

The purpose of the facility is drill cutting drum storage. The facility is not designed for continuous occupancy. Personnel will be present in the facility during drum movements or inspections. There are no significant fire hazards or

other energy sources such as natural gas or propane heating within the facility that could result in energetic dispersal of material.

4.3.1 Worker Exposure to Radiation

The worst-case radiation exposure to the worker was determined by performing a bounding analysis that assumed the material in the facility was to spill and generate a dense dust cloud. A maximum drum alpha-activity of 100 nCi/gram was also assumed. The exposure to plutonium as a result of breathing the dust cloud was calculated to be 0.69 rem/hr. Assuming a worker exits the facility in response to the spill, he would not exceed the DOE limits of exposure (i.e., 5.0 rem for routine operation and 100.0 rem for an accident).

The risk of an individual developing cancer over a lifetime as a result of exposure to plutonium in the dust cloud is estimated to be $4.6\text{E-}06$ (Reference 8).

4.3.2 Worker Exposure to Chemicals

The most likely worker exposure accident identified in storing drums in the drum storage facility are drums toppling over and spilling the contents on the floor. The chemical/toxicological hazards associated with the inhalation of the materials in the soil have been determined to be within the accepted OSHA guidelines (Reference 2). The calculated concentrations were based on worst-case dense cloud (Reference 3 and 4). The dense cloud could be a result of many drums falling and breaking open due to a forklift accident. The results of the calculations are provided in Table 1, and the calculations are documented in Reference 6.

The OSHA-TWA limits represent acceptable concentrations for individual exposure during a normal 40 hour work week. In the event of an accident scenario as described above, the worker would be exposed for a very limited period of time, and is not expected to work in these conditions. Therefore the use of TLV-TWA criteria is conservative.

The calculated risk of an individual developing cancer over a lifetime as a result of the exposure to the chemical contaminants in the dust cloud is less than $1.0\text{E-}06$ (i.e., $3\text{E-}11$) (Reference 6).

4.3.3 Radiological Exposure to the Public

The worst case radiation exposure to the public was determined based on a bounding source term of 8.4 grams of weapons grade plutonium, the upper threshold quantity of plutonium for a non-nuclear facility defined in Reference 7. The whole body dose to the Maximum Offsite Individual is estimated to be $1.8\text{E-}2$ rem, which is well below the DOE limit of 25 rem (Reference 9). The dose is calculated at the plant boundary assuming a release fraction of $1.0\text{E-}3$ and a dispersion factor of $2.21\text{E-}04 \text{ sec/m}^3$ for an individual remaining in the centerline of the plume for the full duration of plume passage.

The calculated risk of an individual developing cancer over a lifetime as a result of the exposure to the chemical contaminants in the dust cloud is less than $1.0\text{E-}05$ (i.e., $9\text{E-}6$) (Reference 8).

4.3.4 Public Exposure to Chemicals

The scenario for the general public is assumed to be caused by a small airplane crash causing all the hazardous chemicals identified in Table 1 to be released to the atmosphere. All drums are assumed to contain the worst case chemicals. At the plant boundary a conservative atmospheric dispersion assumes a ground level release with F stability class and a wind speed of 1 m/s. The dispersion factor (X/Q) for a receptor at the plant boundary, 1900 meters, is calculated to be $2.21\text{E-}04 \text{ sec/m}^3$.

The calculated risk of a member of the general public developing cancer over a lifetime as a result of the exposure to the chemical contaminants in the dust cloud is less than $1.0\text{E-}05$ (i.e., $5.0\text{E-}09$) (Reference 6).

4.4 Hazard Controls

Operation of the drum storage facility will be conducted in accordance with established Standard Operating Procedures and the plant Health and Safety Manual. The facility will also provide controls to maintain total inventories of plutonium less than 8.4 grams to assure the hazard classification as a non-nuclear facility.

5.0 CONCLUSION

The worst-case radiation exposures to the worker was determined by assuming the material in the facility was to spill and generate a dense cloud. A maximum drum alpha-activity of 100.0 nCi/g was also assumed. The exposure to plutonium as a result of breathing the dust cloud was calculated to be 0.69 rem/hr . Therefore, if an individual was exposed to this type of accident, he would not exceed the DOE annual limits of exposure (i.e., 5.0 rem for routine operation and 100.0 rem for an accident).

The worst-case chemical contaminant exposures for the worker is many drums breaking open, as a result of a forklift accident, forming a dense dust cloud of soil and exposing the worker to the chemical contaminants in the soil. The exposure time was assumed to be one minute resulting in an estimated cancer risk of $3\text{E-}11$.

The worst-case radiation exposures to the public was determined based on a small airplane crash, which is a low frequency type of accident (i.e., $1\text{E-}04$ to $1\text{E-}06$ per year), and causing the bounding source term of 8.4 grams of weapons grade plutonium to be released to the general public. The plume is assumed to be released from the facility in a two hour period. The whole body dose to the maximum offsite individual is estimated to be 0.018 rem which is well below the DOE limit of 25.0 rem for a low frequency accident. This assumes the individual remains in the centerline of the plume for the full duration of plume passage.

The worst-case chemical contaminant exposures for the general public is assumed to be caused by a small airplane crash causing all the hazardous chemicals identified in

Table 1 to be released to the atmosphere. At the plant boundary a conservative atmospheric dispersion assumes a ground level release with F stability class and a wind speed of 1 m/s. The dispersion factor (X/Q) for a receptor at the plant boundary, 1900 meters, is calculated to be $2.21E-04 \text{ sec/m}^3$. The exposure time was assumed to be two hours resulting in an estimated cancer risk of $5E-9$.

Workers in the facility should adhere to the Standard Operating Procedures and the Health and Safety Practices. The facility shall also maintain total inventories of plutonium less than 8.4 grams.

6.0 REFERENCES

1. *Annual Report for Treatability Studies Program Fiscal Year 1992*, Rocky Flats Plant, U. S. Department of Energy, February 1993.
2. *Niosh Pocket Guide to Chemical Hazards*, June 1990.
3. *Rocky Flats Risk Assessment Guide*, September 1993.
4. *Project-Specific Health and Safety Plan for in Situ Volatilization Subsurface Interim Measures/Interim Remedial Action East Trenches Area, OU2*, 1992.
5. *Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual (Part A)*, EPA/540/1-89/002 December 1989.
6. SAE Calculation No. 93-SAE-005, *Cancer Risk Calculations for an Accidental Spill in the Drill Cutting Storage Facility*.
7. DOE Standard DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, December 1992.
8. SAE Calculation No. 93-SAE-003, *Dose Calculation for an Accidental Spill in the Drill Cuttings Drum Storage Facility*.
9. DOE Draft Standard DOE-STD--3005-93, *Definitions and Criteria for Accident Analysis*, March 8, 1993.